



A.D. 1869, 26th JULY. N° 2269.

SPECIFICATION

OF

JOHN HENRY JOHNSON.

MANURE.

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A.D. 1869, 26th JULY. N° 2269.

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LETTERS PATENT to John Henry Johnson, of 47, Lincoln's Inn Fields, in the County of Middlesex, Gentleman, for the Invention of "IMPROVEMENTS IN THE TREATMENT OF NIGHT SOIL AND OTHER WASTE PRODUCTS, AND FOR THE MANUFACTURE OF MANURE THEREFROM."—A communication from abroad by James Alexander Manning, of St. Pierre lez Calais, in the French Empire.

Sealed the 25th January 1870, and dated the 26th July 1869.

PROVISIONAL SPECIFICATION left by the said John Henry Johnson at the Office of the Commissioners of Patents, with his Petition, on the 26th July 1869.

I, JOHN HENRY JOHNSON, of 47, Lincoln's Inn Fields, in the County of Middlesex, Gentleman, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN THE TREATMENT OF NIGHT SOIL AND OTHER WASTE PRODUCTS, AND FOR THE MANUFACTURE OF MANURE THEREFROM," a communication from abroad by James Alexander Manning, of St. Pierre lez Calais, in the French Empire, to be as follows:—

10 This Invention relates to certain additions to and improvements upon the process or processes set forth in the Specification of Letters Patent,

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granted to me on the 10th of November 1864, No. 2788, by which additions and improvements a larger per-centage of ammonia, alkaline salts, and phosphates are secured from the night soil and other waste substances of animal, vegetable, and mineral origin, a more rapid conversion of the same is effected, and great economy is effected. 5

In carrying out this Invention I apply carbonaceous matters, such as coal, soot, the charcoal of marine plants, and animal and vegetable charcoal in general saturated with a sufficient quantity of sulphuric acid, to which is also added a salt of magnesia in a pulverulent state, to the cesspits, privies, middens, or latrines of cities, towns, and considerable 10 villages and hamlets, for the purpose of deoderizing and disinfecting the night soil, and retaining its ammonia by counteracting the effect which the fermenting quality of urine in its decomposition produces upon that salt, and collect the night soil so treated and night soil in general when otherwise collected and evaporate the liquid portion thereof so as to bring 15 the whole of the elements of fertility contained in the solid and fluid excrete of the population of towns and places where no sewers exist or merely sewers for surface drainage to a state of dryness in brick evaporating boilers or culverts ranging in their dimensions from thirty to sixty feet, or more or less in length, according to the requirements of 20 the locality, by six feet in width and six feet in depth or other suitable dimensions, the evaporation being accomplished by means of surface heat, accelerated by the introduction of cast-iron cylinders passing under the bottom or inverted arch of the brick culvert or boiler, the furnaces being so arranged as to render chimney shafts unnecessary, all the vapors 25 and gaseous matters from excretæ as well as from the coals consumed being drawn over from the said boiler by means of a powerful exhaust and discharge fan and deposited in proper receptacles for further treatment, by which all the ammonia from the coals as well as the carburetted hydrogen gas are preserved, the former to increase the per-centage of 30 ammonia in the manure to which it is added, and the latter to be employed for lighting the works, and generally for illuminating purposes. The agitation of contents of boiler and the working of the fans being performed by steam power. By these modifications of the process or processes specified in the before-named Patent all wastes (other than 35 night soil or such animal matters as contain a considerable per-centage of ammonia and certain chemical waste salts), that is to say, the wastes of vegetable markets and household refuse and vegetable wastes in

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general, are reduced to ashes either by simple incineration or by means of kilns or other suitable furnaces, and the ash products thus obtained together with a suitable quantity of waste animal charcoal, bones, or ground coprolites converted into superphosphate are mixed with the
5 desecated night soil, in order to increase the per-centage of the mineral constituents so essential to the organism and development of plants, and a manure is manufactured which cannot fail to equal guano, and even surpass it in its stimulating effects and prove more durable in its effects upon the soil, while the continuous deodorization of the night soil at the
10 houses of the inhabitants, as well as its disinfection and the destruction of all putrifying matters which accumulate in cities and towns to the great detriment of the public health will tend greatly to the improvement of their sanitary condition, to the permanent progress and advantage of agriculture, and the general interests of humanity.

15 SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said John Henry Johnson in the Great Seal Patent Office on the 26th January 1870.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOHN HENRY JOHNSON, of 47, Lincoln's Inn Fields, in the County of
20 Middlesex, Gentleman, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-sixth day of July, in the year of our Lord One thousand eight hundred and sixty-nine, in the thirty-third year of Her reign, did, for Herself, Her heirs and successors,
25 give and grant unto me, the said John Henry Johnson, Her special license that I, the said John Henry Johnson, my executors, administrators, and assigns, or such others as I, the said John Henry Johnson, my executors, administrators, or assigns, should at any time agree with, and no others, from time to time and at all times thereafter during
30 the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN THE TREATMENT OF NIGHT SOIL AND OTHER WASTE PRODUCTS, AND FOR THE MANUFACTURE OF MANURE THEREFROM," a communication

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from abroad by James Alexander Manning, of St. Pierre by Calais, in the French Empire, upon the condition (amongst others) that I, the said John Henry Johnson, my executors or administrators, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what 5 manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said John Henry Johnson, do hereby declare the nature of the said Invention, and in what manner the 10 same is to be performed, to be particularly described and ascertained in and by the following statement, that is to say :—

The said Invention has for its object the collection and conversion into manure of the night soil or solid and fluid human excretæ, and the general wastes of cities, towns, and other densely populated localities of 15 animal, vegetable, and some of mineral origin, containing elements of fertility, by the admixture of which together with a suitable per-centage of bones or soluble phosphate of lime in the required proportion for the plant, and more especially for root crops, a highly concentrated manure of the most efficacious character is produced equal to guano in its average 20 per-centage of ammonia, and superior to that valuable matter in its durable effects upon the soil, as it contains all the constituents of fertility which are indispensable to the organism and development of plants. In addition to the chemical and mechanical modes by which I convert the foregoing substances into manure I also preserve the whole of the 25 ammonia contained in the coal consumed in the various operations to which they are subjected, which may either be added to the manure to increase the per-centage of that valuable salt, or may be sold separately as an article of commerce in the form of sulphate of ammonia, while the carburetted hydrogen gas produced by the combustion and nearly 30 destructive distillation of the coal passes to the purifier and from thence to the gas holder, where it is stored for lighting the works or other generally illuminating purposes. In the collection of the night soil much must depend upon the facilities afforded in different localities. I prefer collecting these wastes by means of the barometric system, which consists 35 of a portable pump and hose worked by two lever handles, which discharges the contents of the cesspits into a hermetically closed barrel cart, on the top of which is a second valve, to which a short pipe is

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attached for conducting the gases (pumped up from the cesspit in combination with the fœcal matters into the barrel cart) into a small chamber or cavity beneath the bars of a portable furnace, through the flames of which the gases must pass, whereby all offensive smell is
5 destroyed and the whole operation is performed without dirt, bad odour, or any nuisance whatever in one-fourth of the time consumed by the ordinary mode of emptying the cesspits with buckets. In cursorily describing the barometric system I do not lay any claim to it as my Invention; but as in its practical operation on the Continent it has proved
10 inefficient for the discharge from the cesspits of the solid portion of the fœcal matter by which the householders are after a time compelled to have recourse to the old method of emptying the same by the spade and bucket, I purpose wherever it is practicable to employ the barometric system to pass the hose to the bottom of the cesspit, through a skeleton
15 tube, on the outside of which at given distances will be attached on moveable iron circles a series of knives and beaters for the purpose of agitating the solid and fluid excretæ and amalgamating or bringing them to such a state of liquid consistence or liquefaction as will allow the whole to pass through the pump into the barrel cart. The iron circles
20 from which the arms or agitators issue are connected by upright iron bars to a horizontal wheel capping the skeleton tube, which is made to rotate by a cog wheel put in motion by means of a winch handle above the seat of the privy or cesspit so that the pumping operation shall not be interfered with, while a close cover fitting the seat (through which the
25 skeleton tube and hose will be admitted will effectually prevent the escape of all dangerous or disagreeable gases or odours. In all cases where the cesspits are not already cemented they must be rendered water-tight to prevent the draining away of the urine. In some localities I may adopt the system of "fosses mobiles" or moveable tanks or barrels,
30 this system being successfully employed in the most populous quarters of Paris, at Lorient, in Brittany, and other towns in France, the tanks or barrels being removed at stated or desirable periods and replaced by clean ones; but in either or any mode of collection the fœcal matters are treated chemically in the cesspits or barrels, so that the whole of their
35 nitrogen or ammonia shall be entirely fixed and preserved, and the fermentation arising from the decomposing urine is entirely prevented, as such fermentation converts all the different forms of ammonia found in the solid and fluid excretæ into carbonate of ammonia, the most volatile of all the forms of that salt, and which being constantly

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evolved into the atmosphere causes a loss of two-thirds of that valuable ingredient during the period that the fœcal matter is generally allowed to remain in the cesspit. For the purpose of preventing this loss to agriculture, I employ sulphuric acid in the proportion of about five pounds of acid to every hundred pounds of fresh solid and fluid fœcal matters, containing three pounds of nitrogen, or a smaller quantity in proportion with the smaller per-centage of ammonia generally discovered in old and stale excretæ which have not been previously treated chemically in the cesspits. Other substances, such as soot, vegetable ashes, vegetable charcoal, and particularly seaweed charcoal, when the weed can easily be obtained for manufacture, together with bone dust, or in the form of phosphate of lime or magnesia, will be added as disinfectants and deodorisers. The evaporating cistern or culvert for reducing the mixed solid and fluid human excretæ to within ten or twelve per cent. of dryness, and into which the fœcal matters may be discharged on their arrival at the works, are long cisterns or culverts, varying in their dimensions from thirty to sixty feet in length by six feet in width and six feet in depth, or other suitable dimensions according to the requirements of the locality. The bottom of the cistern together with from two feet six inches to three feet on each side of the bottom or inverted arch is constructed with fire-brick or with hard sound bricks cemented with mortar mixed with aluminous shale or fire-clay or aluminous clay the rest of the cistern together with the flat arch covering the same to be built entirely with fire-brick laid in the ordinary manner to resist the action of the flames which will pass from an upper and a lower furnace, the one being situate at or near the top and the other beneath the said cistern, so as to heat its contents simultaneously from the top and bottom thereof. A single furnace alone might be employed in conjunction with flues and dampers so arranged as to admit of the products of combustion passing both inside and under the cistern, or inside the cistern or under it at pleasure. Thus the process of evaporation is accelerated by the passage of the flames from the upper furnace over and along the whole interior surface of the cistern immediately above the liquid with which it is charged and under the flat arch or covering of the same, the said second or upper furnace being set almost on a level with the liquid when the cistern is charged to its fullest extent, that is to say, to within eighteen inches or two feet of the top of the flat arch. By this means a very elevated temperature is produced in the interior of the cistern, which added to the external heat

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of the lower furnace causes a rapid ebullition and the speedy evaporation of the whole of the liquid contents of the cistern. The bars of this furnace are long and placed at a low level to prevent any appreciable quantity of ashes being carried by the draught into the cistern. The
5 vapours arising from the evaporation of the liquid portion of excretæ and the gases as well as the smoke from both furnaces are drawn into the brick base of a large iron cylinder issuing from the opposite end of the cistern by means of an exhaust and discharge fan attached to said cylinder, which dispenses with the necessity of a chimney shaft, the most
10 powerful draught being obtained according to the velocity with which the fan is made to rotate by means of steam or other power, all the gases, vapor, and smoke being discharged by the fan under considerable pressure into a cast or wrought iron, or brick, or other suitable receiver surrounded by an outer vessel having a constant flow of water through
15 it in order to condense the vapours; while the carbunetted hydrogen gas passes off by an ascension pipe on the top of the receiver into the wet and dry lime purifiers, and from thence to a gas holder, where it is stored for lighting the works or for other illuminating purposes. The water of condensation retained in the receiver forming a weak
20 ammoniacal liquor is drawn off from time to time into a large cast-iron still, and treated in the ordinary manner for the manufacture of sulphate of ammonia, which may be added to the manure to increase its per-centage of ammonia, or may be sold separately as an article of commerce. During the distillation over of the ammoniacal
25 gases or vapors into the sulphuric acid tuns or crystallizers, instead of subjecting the weakened ammoniacal liquor or solution to a second operation or redistillation towards the end of the operation, I inject a suitable quantity of cream of lime into the boiling liquor by means of a force pump, which has the immediate effect of liberating the whole of
30 the remaining ammonia and passing it into the crystallizers. The interior of the brick evaporating cistern is furnished with an agitator consisting of a strong rocking shaft passing from end to end thereof, and supported by cross bars or bearings, and carrying a series of knives or cutters and beaters alternately placed, which do not rotate, but are
35 moved to and fro constantly over the bottom of the cistern during the dessication of the excretæ by motive power, by which the sediment is eventually reduced to the finest pulverulent state, whilst it prevents the hardening of the magnesia and other salts contained in the fœcal matter, which without the system of agitation would form a crust over the

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surface of the liquid and intercept the action of the heat so as to retard the dessication of the excretæ. In order to render the charring of the sediment or manure impossible when about seventy-five per cent. of the urine or water are evaporated, the fire is withdrawn from the lower or underneath furnace or allowed to die out, leaving the dessication of the 5 sludge entirely to the action of the internal temperature, that is to say, to the heat from the flames passing from the upper furnace in a straight line under the flat arch of the cistern to the brick base of the iron cylinder, by means of the powerful draught produced by the action of the exhaust and discharge fan before referred to. To prevent too injurious an 10 action of the flames upon the iron cylinder to which the fan is attached a jet of steam is introduced into the brick base thereof at the commencement of the operation, that is to say, as soon as the fires are lighted, and is continued until the evaporation of the liquor in the cistern renders it no longer necessary, but the steam is turned on again towards the 15 termination of the operation, when the fœcal matter is brought almost to dryness. The mode of charging the brick evaporating cistern is by a suitable opening or openings on the crown of the flat arch, having appropriate covers for closing the same when charged. At the end of the evaporating cistern there is a large man-hole, the 20 iron door or cover of which is lined on the inside with lead to prevent the oxidation of the iron, which would otherwise be produced by the action of the sulphuric acid with which the excretæ are treated. The discharge of the dry manure from the evaporating cistern is effected by means of long handled scrapers introduced therein through the 25 man-hole, the arms of the agitator being turned upwards or out of the way to facilitate the passing and re-passing of the scrapers. The dry manure being drawn from the cistern on to the floor of the store room or other chamber is speedily cooled by spreading it over the floor by means of rakes, and the cooling is further accelerated by the admixture 30 therewith of the phosphate of lime and any other fertilizing substances which it may be deemed advisable to add thereto. I may sometimes reduce the boiled bones to a fine state of division by grinding or crushing the same, and after applying a suitable quantity of sulphuric acid in order to convert the carbonate of lime contained in the crushed bones to 35 sulphate of lime, and if necessary to convert a portion of the phosphate of lime into superphosphate, I mix the desired quantity per ton with the solid and fluid fœcal matter, to which sufficient sulphuric acid has been previously added to fix the whole of its ammonia, and I subject the

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whole to the process of boiling in my brick evaporating cistern and bring the bone dust as well as the solid fœcal matter to a state of dryness. Or such an additional quantity of sulphuric acid may be added to the fœcal matter as shall not only fix the ammonia but shall also convert the bone
5 dust into superphosphate. With respect to other waste substances of towns and other localities of animal, vegetable, and mineral origin containing the elements of fertility which can be obtained at trifling cost, I subject the vegetable wastes to the simple process of incineration, by which while depriving them of their fibrous and comparatively worthless
10 organic matter I obtain in the most highly concentrated form all those inorganic constituents which are indispensable to the structure and development of plants, and which if not restored to the soil must necessarily impoverish it. Other substances, such, for instance, as seaweed, may be used, which I convert into charcoal either by carbonization
15 or reduction by sulphuric acid, fish curers, waste salt, the dog fish, stale fish of all kinds, and fish offal may be used, which latter substances I boil, dry, and reduce to powder. I also take blood from the slaughter houses, which I treat with sulphuric acid in order to retain its ammonia, then evaporate to dryness, and bring it to a pulverulent state; I also
20 employ coal soot, which independently of other valuable salts contains one-eighth of its bulk of sulphate of ammonia, and is as well as the seaweed charcoal a very powerful disinfectant and deodorizer, both of which are employed by me in combination with sulphuric acid for this purpose in treating the fœcal matter in the cesspits; all these substances, as
25 well as phosphate of lime prepared from bones or bone dust, capolites, or waste animal charcoal, should be collected and treated in a suitable manner (where they can be obtained at a trifling or reasonable cost) in order to mix with the dry fœcal matter in suitable proportions so as to obtain from the wastes of towns and other easily procurable matters a
30 first class manure containing in its per-centage of soluble phosphates, alkaline salts, and salts of ammonia, as also of a cheap potash particularly adapted for beetroots and potash plants in general, all that is essential for the development of plants and the permanent progress of agriculture, as well as the improved sanitary condition of towns and other densely
35 populated localities by the disinfection and removal therefrom of all animal and vegetable wastes from which mephitic gases are generated.

Having now described and particularly ascertained the nature of the said Invention, and the manner in which the same is or may be used or carried into effect, I would observe in conclusion that what I consider

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to be novel and original and therefore claim as the Invention secured to me by the herein-before in part recited Letters Patent is,—

First. The heating of the evaporating cistern simultaneously from the upper and under surface thereof, substantially as and for the purpose herein-before described. 5

Second. The combination with a cistern heated as above set forth of mechanical stirrers arranged and working substantially in the manner and for the purpose herein-before described.

Third. The drawing off of the vapors from the cistern as well as the smoke or products of combustion from the furnaces employed in 10 conjunction with such cistern or used for other purposes by means of an exhaust and discharge fan, and discharging such vapors or smoke or products of combustion into condensing tanks, whereby the use of a chimney is dispensed with, and the ammoniacal liquor may be utilized, substantially as herein-before described. 15

Fourth. The mode of collecting and utilizing the otherwise waste carburetted hydrogen gas evolved from the coal consumed in the process of manufacturing the manure, or from coal consumed in other parts of the process or other manufactories, for the purpose of lighting the works in lieu of allowing the same to escape into the atmosphere, as herein-before 20 described.

In witness whereof, I, the said John Henry Johnson, have to this my Specification set my hand and seal, this Twenty-sixth day of January One thousand eight hundred and seventy.

J. HENRY JOHNSON. (L.S.)

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